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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

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REPLY TO: 5230 Evaluation

January 18, 1978

SUBJECT: Biological Evaluation of Mortality on Downieville R.D.

TO: Forest Supervisor, Tahoe NF 23000 Date

A biological evaluation of recent mortality in the vicinity of Bullards Bar Reservoir was requested by Phil Aune. The evaluation was conducted on December 14, 1977, by Dave Schultz and Ed Wood of the FIDM Staff accompanied by Bruce Moyle and several of the Downieville R.D. personnel.

Much of the area visited was under 3,000 feet elevation and the forest cover consisted of ponderosa pine, sugar pine and Douglas-fir with an understory of tan-oak and madrone in some places. While weather records for the immediate area aren't available, the average of the normal annual precipitation received at the Downieville R.S., Challenge R.S. and Nevada City is 63.11 inches. The average for these three stations was near normal in 1975 (61.14 in.), far below normal in 1976 (20.39 in.) and only 17.37 inches was received through August 31 of 1977.

Evaluation

Two areas representative of the mortality situation were examined.

Long Point Ridge. The area of concern was a grove of mature sugar pine which was showing very heavy mortality. There was a dense understory of tan-oak and madrone and the basal area of the stand was 300-400 square feet per acre. The faded sugar pine showed signs of woodpecker activity in the upper boles which indicates they had broods of mountain pine beetle (Dendroctonus ponderosae) last winter and were probably attacked during the summer of 1976. The lower boles did not show any signs of mountain pine beetle, but there were turpentine beetle pitch tubes (Dendroctonus valens) up to a height of 15 feet.

Willow Creek. Rather extensive ponderosa pine mortality was noted on this south slope. Evidence of western pine beetle (Dendroctonus brevicomis) was found in the older mortality and attacks were present on recent fades although only a few small pitch tubes were present. Several recently faded Douglas-fir which contained broods of Scolytus unispinosus were noted in the same area.

Discussion

The distribution of mortality observed, patterns of bark beetle attacks within the trees and the number of tree and beetle species involved all indicate that the current mortality is primarily a response to drought rather than an insect outbreak. The turpentine beetle is normally restricted to the root collar and lower bole of healthy trees. The presence of turpentine beetle pitch tubes to a height of 15 feet indicates that these trees were under severe moisture stress at the time of attack. Many bark beetle species have aggregating pheromones which attract beetles to a tree under successful attack. The fact that the boles of much of the current mortality weren't filled in by either the western or mountain pine beetle suggests that populations of these insects aren't currently high enough to take advantage of the large number of dying trees. The widespread mortality throughout the District, as shown on the December 6 sketch map prepared by the Forest, rather than concentrated "hotspots", as well as the number of insect and tree species involved, also indicate the current situation is not an insect outbreak.

This pattern of mortality has become common throughout Northern California this summer and fall and can be expected to continue this spring, even if winter precipitation is "normal". Some of the green trees in the mortality areas are actually dead, but won't fade until spring or summer. More trees may also be expected to die because it will take time for them to recover their vigor after soil moisture returns to normal. This type of mortality may be anticipated on the lower sites, in overstocked stands and in individual overmature trees. Although the length and severity of the current drought is unusual, it is likely there will be more dry periods during the rotation age of some of these stands. The level of stocking that a site will support declines as soil moisture is reduced and this might be considered in any silvicultural treatments planned for these areas. Timber stand improvement such as thinning or reducing hardwood competition might be justifiable on the better sites to insure good growing conditions through periods of less than normal precipitation. Thinning stands or reducing hardwood competition will increase the phloem moisture of the residual trees and increase their resistance to bark beetles. Tree mortality may also be prevented by the removal of susceptible or high-risk trees during sanitation-salvage programs. Such trees may be affected by dwarf-mistletoe and/or root diseases and show some signs of poor vigor such as dead tops or twigs, decreasing internode length, poor needle retention and advanced age.

Normally, our suggestions for marking a salvage sale would be to include taking the faded trees as well as those in the vicinity showing obvious pitch tubes on the boles, however, moisture stress from the recent drought has prevented many of the trees from producing pitch tubes and it is difficult to detect attacks on these trees without chopping into

them or waiting until they fade. If dead trees are being marked for salvage this year, it might be advantageous to also mark any nearby high-risk trees. Following salvage operations, some stands may be understocked to the point where complete overstory removal and reforestation is warranted. In any reforestation or thinning operation, a mixture of species in the stand would be desirable to minimize forest pest problems. In addition to providing biological barriers to the spread of host-specific pests, a mix of species gives some insurance against a total loss due to any one organism.

In the current mortality situation, minimal emphasis should be placed on the timing of salvage to control bark beetles because so few of the trees have large numbers of beetles in them. Timing of salvage will be important from the standpoints of deterioration of dead timber and slash disposal. Among the current mortality, small diameter ponderosa pine will deteriorate most rapidly followed by large diameter ponderosa pine, sugar pine and Douglas-fir. The time of salvage will affect the possibility of Ips build-up if any green pine is cut. These beetles breed in small diameter pine which is either alive or recently cut. There can be up to five generations per year and normally the heaviest Ips population losses occur during the winter. Although it is important to avoid creating large amounts of Ips breeding material at any time of year, the most critical period is from December through June. Most trees are not under severe moisture stress at this time of year which reduces the natural breeding areas for Ips at a time when populations are at their lowest level. Also the slash created at this time doesn't dry out rapidly so it remains useable by the beetles for a longer period of time. Methods which have been used to dispose of slash include chipping or mashing at any time of year and lopping and scattering in sunny areas during warm weather when the slash will dry rapidly. Slash can also be piled and burned, but Ips can complete a generation in as little as five weeks so this work has to be completed rapidly. Branches or tops which have already faded can't be used for breeding so treatment of dead slash is unnecessary.

Management Alternatives

1. Do nothing. The type of mortality which has been experienced will continue for at least a year after soil moisture returns to normal. Some stands will be left understocked and others will be in the same overstocked or overmature conditions which led to mortality during the recent drought.

2. Salvage dead and dying trees only. This would reduce the number of beetles in the immediate area, but probably would have little effect on future mortality as long as green slash is disposed of properly. Salvaging within a year after mortality will have the advantages of recovering the highest timber grade and volume and reducing fuel load, but the future stand conditions will essentially be the same as with the first alternative.

3. Salvage and Sanitation. The removal of high-risk trees while salvaging dead timber would recover volume which might be uneconomical to salvage if the high-risk trees died as isolated individuals at a later date.

Removal of high-risk trees might have a small effect on reducing future mortality because the live basal area will be reduced and the residual trees should be more vigorous. In addition, the removal of high-risk trees will eliminate the trees which are most susceptible to bark beetles and could possibly prevent the build-up of bark beetles in an area.

4. Salvage, Sanitation and Timber Stand Improvement. Various TSI measures such as control of the stocking level, reduction of hardwood competition and control of stand species composition could be carried out at the same time or following salvage-sanitation. The increased growth rate as a result of these measures should make the stands more vigorous and more resistant to pests. The advantage of vigorous pest-resistant stands will probably become most apparent during future periods of below-normal precipitation.

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